

NPN POWER SILICON TRANSISTOR

Devices

2N5002

2N5004

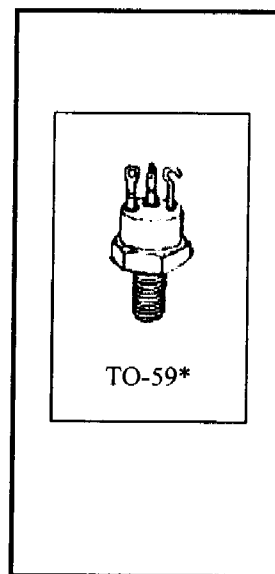
MAXIMUM RATINGS

Ratings	Symbol	Value	Units
Collector-Emitter Voltage	V_{CEO}	80	Vdc
Collector-Base Voltage	V_{CBO}	100	Vdc
Emitter-Base Voltage	V_{EBO}	5.5	Vdc
Collector Current	I_C $I_C^{(3)}$	5.0 10	A dc
Total Power Dissipation @ $T_A = 25^\circ\text{C}^{(1)}$ @ $T_C = 25^\circ\text{C}^{(2)}$	P_T	2.0 58	W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.0	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	88	$^\circ\text{C}/\text{W}$

- 1) Derate linearly 11.4 mW/ $^\circ\text{C}$ for $T_A > 25^\circ\text{C}$
- 2) Derate linearly 331 mW/ $^\circ\text{C}$ for $T_C > 25^\circ\text{C}$
- 3) This value applies for $P_w \leq 8.3$ ms, duty cycle $\leq 1\%$



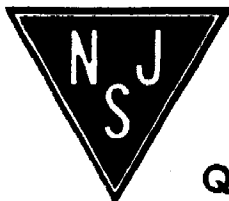
*See appendix A for package outline

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Min.	Max.	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage $I_C = 100$ mAdc,	$V_{(BR)CEO}$	80		Vdc
Collector-Emitter Cutoff Current $V_{CE} = 40$ Vdc, $I_B = 0$	I_{CEO}		50	μAdc
Collector-Emitter Cutoff Current $V_{CE} = 60$ Vdc, $V_{BE} = 0$ $V_{CE} = 100$ Vdc, $V_{BE} = 0$	I_{CES}		1.0 1.0	μAdc mAdc
Emitter-Base Cutoff Current $V_{BE} = 4.0$ Vdc, $I_C = 0$ $V_{BE} = 5.5$ Vdc, $I_C = 0$	I_{EBO}		1.0 1.0	mAdc mAdc



ELECTRICAL CHARACTERISTICS (Con't)

Characteristics	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS				
Forward-Current Transfer Ratio $I_C = 50 \text{ mA dc}, V_{CE} = 5.0 \text{ V dc}$ $I_C = 2.5 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}$ $I_C = 5.0 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}$	2N5002	20 30 20	90	
$I_C = 50 \text{ mA dc}, V_{CE} = 5.0 \text{ V dc}$ $I_C = 2.5 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}$ $I_C = 5.0 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}$	2N5004	50 70 40	200	
Base-Emitter Voltage Non-saturated $V_{CE} = 5.0 \text{ A dc}, I_C = 2.5 \text{ A dc}$	V_{BE}		1.45	Vdc
Collector-Emitter Saturation Voltage $I_C = 2.5 \text{ A dc}, I_B = 250 \text{ mA dc}$ $I_C = 5.0 \text{ A dc}, I_B = 500 \text{ mA dc}$	$V_{CE(sat)}$		0.25 1.5	Vdc
Base-Emitter Saturation Voltage $I_C = 2.5 \text{ A dc}, I_B = 250 \text{ mA dc}$ $I_C = 5.0 \text{ A dc}, I_B = 500 \text{ mA dc}$	$V_{BE(sat)}$		1.45 2.2	Vdc

DYNAMIC CHARACTERISTICS

Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 500 \text{ mA dc}, V_{CE} = 5.0 \text{ V dc}, f = 10 \text{ MHz}$	2N5002 2N5004	$ h_{fe} $	6.0 7.0	
Output Capacitance $V_{CB} = 10 \text{ V dc}$		C_{obo}	250	pF

SWITCHING CHARACTERISTICS

Turn-On Time $I_C = 5 \text{ A dc}; I_{B1} = 500 \text{ mA dc}$		t_{on}	0.5	μs
Storage Time $I_{B2} = -500 \text{ mA dc}$		t_s	1.4	μs
Fall Time $V_{BE(OFF)} = 3.7 \text{ V dc}$		t_f	0.5	μs
Turn-Off Time $R_L = 6 \Omega$		t_{off}	1.5	μs

SAFE OPERATING AREA

DC Tests $T_C = +25^\circ\text{C}, V_{CE} = 0, t_p = 1 \text{ second 1 Cycle}$
Test 1 $V_{CE} = 12 \text{ V dc}, I_C = 5 \text{ A dc}$
Test 2 $V_{CE} = 32 \text{ V dc}, I_C = 1.7 \text{ A dc}$
Test 3 $V_{CE} = 80 \text{ V dc}, I_C = 100 \text{ mA dc}$

